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Olin CHEMICALS

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February 21, 1994

VIA FEDERAL EXPRESS

Kenneth A. Lucas
Remedial Project Manager
United States Environmental Protection Agency
345 Courtland Street Northeast
Atlanta, Georgia 30365

Re: Addendum to Feasibility Study Report
Remedial Alternatives for Strong Brine Pond Area
Olin Chemicals/McIntosh Plant Site
McIntosh, Alabama

Dear Mr. Lucas:

In accordance with your request of February 17, 1994, attached is a letter report presenting remedial alternatives for the strong brine pond area and updating the cost tables for OU-1 soil alternatives presented in the Feasibility Study (FS) report. This is an addendum to the October 21, 1993, FS report, and we have reiterated parts of the FS text regarding alternatives for OU-1 soils to facilitate cross-referencing. This may have resulted in a longer report than you expected, but it provides a good connection between this letter report and the FS report. The relationship of the addendum to the FS report is explained in the Introduction of the letter report. For your purposes, I believe you will find the heart of the information is provided in Table 3, the summary of the detailed analysis; Table 4, the summary of the comparative analysis; and Attachment 1, the revised cost tables.

Please let me know if you have any questions.

Sincerely,

J. C. Brown

J. C. Brown
Manager, Environmental Technology

\jcb
Attachment

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cc: W. A. Beal
J. M. Burns
D. E. Cooper (2)
L. S. Casteel
A. S. Karlin
T. B. Odom

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1.0 INTRODUCTION

Olin Corporation is conducting a Remedial Investigation/Feasibility Study (RI/FS) at its McIntosh, Alabama facility under the oversight of the U. S. Environmental Protection Agency (EPA). In comments on the draft FS report, EPA directed Olin to provide remedial alternatives for solid waste management units (SWMUs)/areas of concern (AOCs) in addition to the two for which alternatives were provided in the draft FS report. These additional units were the old plant landfill drainage ditch, the lime ponds, the sanitary landfills, the mercury cell plant and the well sand residue area. Although the data collected and analysis conducted during the RI indicated that these units and areas are protective of human health and the environment, EPA required that alternatives be developed with the objective of ensuring that conditions at these SWMUs/AOCs remain protective. The final FS report was approved by EPA on February 1, 1994. Subsequent to this approval, EPA decided that remedial alternatives should also be developed for the strong brine pond area and requested by letter dated February 17, 1994, that Olin provide these alternatives and revised costs as an addendum to the FS report. This report includes potential remedial actions for the strong brine pond and constitutes an addendum to the October 21, 1993 FS report. This addendum should be read in conjunction with the FS report. Cross-references to the FS report have been provided and FS report material has been reiterated as appropriate to make this addendum as stand-alone as possible. The major section heads of the addendum are the same as those of the FS report to aid the reader in referring to it. The logic of the report is the same as that of the FS report: i.e., remedial action objectives are first identified; technologies are assembled and screened based on technical implementability; process options are evaluated; retained technologies are combined into alternatives, and alternatives are analyzed in detail. Specifically, the addendum repeats text from the FS report relating to remedial alternatives for OU-1 soils, within which the strong brine pond area is located, and includes amendments to this text to explain how actions related to the pond area would be incorporated into these alternatives.

The addendum includes four tables, one figure, and an attachment. These all have equivalents in the FS report. Table 1 of the addendum is in the same format as Tables 2-11 through 2-16 of the FS report and serves the same purpose: presents the initial screening of technologies and process options for an individual SWMU/AOC. Table 2 corresponds to Tables 2-19 through 2-24 of the FS report and presents the evaluation of process options for the strong brine pond area. Table 3 is an update of Table 4-4 of the FS report and summarizes the detailed analysis for all SWMUs/AOCs related to OU-1 soils. Table 4 is an update of Table 4-10 of the FS report and summarizes the comparative analysis of alternatives for the same SWMUs/AOCs. Figure 1 is an update of Figure 4-19 of the FS report and presents the location of additional wells to monitor the strong brine pond area.

The attachment presents cost tables for the three OU-1 soil remedial alternatives affected by the inclusion of the strong brine pond. These tables are numbered 42, 43, and 44, and are updates to Tables 22, 23, and 24 of Appendix G of the FS report. The costs from these tables are summarized in tables inserted into the text of the addendum under each alternative.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section presents the following steps related to defining potential remedial action in the strong brine pond area:

- Develop remedial action objectives
- Develop general response actions
- Identify volumes and areas of potentially affected media
- Identify and screen remedial technologies and process options
- Evaluate technology process options

2.1 Remedial Action Objectives

The strong brine pond was a former process unit that was removed in 1985. It was approximately 340 x 340 feet and constructed partially above-grade in natural clay. The strong brine pond was a holding pond for the strong brine process fluid that was removed from the brine wells for use in the mercury cell plant. The pond was sampled to assess whether mercury-containing brine seeped from the pond and contaminated the underlying soils to the extent that mercury could be leached to the groundwater. Two soil borings were completed in the strong brine pond area, as shown in Figure 1-12 of the FS report. The borings were to a depth of 2 to 4 feet into the natural soils below the base of the pond. One sample of the natural soil from the base of each boring was collected and analyzed for TCLP mercury. Mercury concentrations from the TCLP leachate were 5 $\mu g/l$ and 30 $\mu g/l$ for the two samples. Pages 2-2 through 2-25 should be consulted if the reader needs additional background information regarding remedial action objectives.

The OU-1 soil remedial action objective (RAO) for human health protection is to prevent ingestion/direct contact with soils having contaminant concentrations with a cumulative cancer risk in excess of 1×10^{-04} to 1×10^{-06} or a noncarcinogenic hazard index greater than 1. The environmental protection RAO is to prevent migration of contaminants that would result in groundwater contamination in excess of groundwater remediation goals. Since the material from the strong brine pond was removed and the area has been capped with clay, the soils in the strong brine pond area are not a direct contact, ingestion or inhalation hazard. The fate and transport analysis described in Section 1.4 of the FS report indicates that the strong brine pond is not a continuing source of groundwater contamination. The analysis is based on calculated infiltration rates through 6 feet of uncompacted silty clay material. This is conservative because the analysis did not consider the compaction of the backfill material or the overlying cap. The remedial objective for the strong brine pond area is to assemble appropriate alternatives that ensure that conditions remain protective (i.e., the RAOs would not be exceeded) under reasonable future conditions.

2.2 General Response Actions

The following general response actions were developed in Section 2.3.2 of the FS report for OU-1 soils, and are applicable to the strong brine pond area.

- No Action, which involves leaving the facility "as is" with no provisions for control or cleanup of the contamination.

- Institutional Controls, which involve the creation and implementation of mechanisms, both physical and legal, that restrict public and environmental contact with the contaminants without addressing actual remediation of the contamination. Typical institutional controls for soils include access and deed restrictions.

- Containment, which involves physical actions to isolate contamination from potential exposure and/or restrict contaminant mobility by limiting the possible exposure paths and transport mechanisms.

- Removal, which involves the direct physical removal of the soils through excavation. Removal is commonly conducted in conjunction with soils treatment and/or disposal.

- Treatment, which involves on-site, off-site and/or in situ measures to reduce the toxicity, mobility and/or volume of the contamination in the soils.

- Disposal, which involves discarding contaminated soils and/or treatment residuals in an approved manner and at an approved site (either on- or off-site).

2.3 Volumes and Areas of Potentially Affected Media

The estimated area of strong brine pond is about 120,000 square feet. An area of 130,000 square feet is assumed for the containment alternatives, assuming that a cap would extend beyond the boundaries of the pond. All the material was removed from the ponds during closure, and therefore a volume estimate is not applicable.

2.4 Identification and Screening of Remedial Technologies and Process Options

Table 1 of this report lists the potential treatment technologies and corresponding process options for the strong brine pond. The remedial technologies and process options identified in Table 1 were first screened on the basis of technical implementability. Those that could not be effectively implemented at the facility were screened out using the information available from the RI site characterization, such as contaminant types, contaminant concentrations, and site characteristics. A description of each process option is included in Table 1 of this report to allow an understanding of each option and to assist in the evaluation of its technical implementability. The screening comments address the technical feasibility and ability of a given process option to serve its intended purpose. Table 1 also includes a statement as to whether each process option was retained for further evaluation or was screened out.

2.5 Evaluation of Technology and Process Options

The process options that were retained for the strong brine pond (See Table 1 of this report) were further evaluated based on effectiveness, implementability, and relative cost. The evaluation of the strong brine process options is presented in Table 2 of this report. The retained options are summarized below in a table that constitutes an extension to the table on page 2-49 of the FS report.

Summary of Retained Process Options OU-1 Soil		
General Response Action	**Technology Type**	**Process Option**
Strong Brine Pond		
No Action	None	None (Continue existing maintenance programs)
Institutional Actions	Monitoring/Maintenance	Cap Inspection/Maintenance
	Monitoring	Groundwater Monitoring
Containment Actions	Capping	Clay Cap Multi-Media Cap

The screening and evaluation summarized in Tables 1 and 2 of this report resulted in retention of remedial technologies and process options to be carried forward for incorporation into the FS remedial alternatives.

3.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

Remedial alternatives were assembled in Section 3.0 of the FS report for different areas found in the site characterization to contain hazardous substances. The old plant landfill drainage ditch, sanitary landfills, lime ponds, mercury cell plant, and well sand residue area were areas found in the site characterization to contain hazardous substances, but were not identified as potential continuing sources of groundwater contamination. The RI data and the evaluation in the FS report indicate that soils contained within these areas meet the remedial action objectives. However, in order to ensure the continued compliance with RAOs, appropriate remedial alternatives for these areas were assembled. Technologies and process options that were retained to address these areas included a range of monitoring, maintenance and containment process options. Because these areas are similar physically with the same remedial objective, alternatives were assembled to address four SWMUs/AOCs collectively. (The old plant landfill drainage ditch was addressed with the old plant (CPC) landfill alternatives). The situation is similar for the strong brine pond. The soils beneath the former strong brine pond contain a hazardous constituent (i.e., mercury) but these soils were not identified as a continuing source of groundwater contamination. (See Sections 1.3 and 1.4 of the FS report for the basis of this identification). Therefore, the strong brine pond is grouped with the alternatives that were developed in the FS for the sanitary landfills, lime ponds, mercury cell plant, and well sand residue area. Five alternatives (including no action) were assembled for these areas and their development is presented in Section 3.2.2 of the FS report beginning at page 3-24. The five alternatives are repeated below with additional discussion of the actions that would be implemented at the strong brine pond area for each alternative.

Soil Alternative A - No Action: Sanitary Landfills, Lime Ponds, Mercury Cell Plant, the Well Sand Residue Area and the Strong Brine Pond Area

Alternative A is the no action alternative. Olin would continue to maintain the caps (including the cap over the strong brine pond) with their existing maintenance programs. Olin would also continue the existing groundwater monitoring and corrective action programs as required by the RCRA post-closure permit.

Soil Alternatives B1 and B2 - Institutional Actions: Sanitary Landfills, Lime Ponds, Mercury Cell Plant Area the Well Sand Residue Area and the Strong Brine Pond Area

Institutional actions have already been implemented at the site. Access to the SWMUs/AOCs is restricted by fencing; the deed for the McIntosh property has a statement regarding the presence of hazardous waste on-site, and Olin conducts quarterly groundwater monitoring as part of their RCRA compliance and corrective action programs.

Alternatives B1 and B2 would include implementing additional institutional actions to ensure that conditions at the SWMUs/AOCs remain protective. The institutional actions that were retained in Section 2.4 of this report for the strong brine pond include:

- Groundwater monitoring
- Cap inspection/maintenance

Two institutional action alternatives were evaluated in the detailed analysis in Section 4.0 of the FS. Actions at the strong brine pond that would be added to these two alternatives include:

- Cap inspection/maintenance in the strong brine pond area would be added to Alternative B1.

- Cap inspection/maintenance and increased groundwater monitoring in the vicinity of the strong brine pond would be added to Alternative B2.

Soil Alternatives C1 and C2 - Containment/Institutional Actions: Sanitary Landfills, Lime Ponds, Mercury Cell Plant Area the Well Sand Residue Area and the Strong Brine Pond Area

Alternatives C1 and C2 would include a combination of containment and institutional actions. The institutional actions for alternatives C1 and C2 would be similar to those described for Alternative B1 (i.e., cap inspection/maintenance programs would be implemented in the strong brine pond area).

Containment of the strong brine pond would be added to both alternatives C1 and C2. Multi-media and clay caps are containment process options that were retained in Section 2.4 of this report. The fate and transport analysis in Section 1.4 of the FS report indicated that the strong brine pond soils are not a continuing source of groundwater contamination and this analysis was conducted without consideration of the existing cap.

Therefore, the objective of containment would be to provide a permanent barrier over the contaminated soils to prevent contact by humans or releases to the environment via air or surface water pathways. A multi-media cap would provide marginal, if any, increased effectiveness over clay at meeting this objective. Therefore, alternatives C1 and C2 would include a clay cap for the strong brine pond.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

Background material regarding the detailed analysis of alternatives can be found in Section 4.1, pages 4-1 through 4-4, and in Section 4.2.4, page 4-58, of the FS report.

4.1 Individual Analysis of Alternatives

The section presents descriptions of how the strong brine pond process options would be implemented with each of the five alternatives retained in Section 3.0 of this report. Where appropriate, discussion is presented on how actions in the strong brine pond would affect the evaluation against the RI/FS guidance screening criteria. Table 3 of this report summarizes the evaluation of retained OU-1 soil alternatives that include actions for the strong brine pond area.

Soils Alternative A - No Action: Sanitary Landfills, Lime Ponds, Mercury Cell Plant Well Sand Residue Area and Strong Brine Pond Area

Alternative A would allow the soils at the SWMUs/AOCs, including the strong brine pond, to remain as they currently exist with no provisions for reduction in contaminant toxicity, mobility or volume. Olin would continue to maintain the cap over the strong brine pond and would continue the existing groundwater monitoring and corrective action programs as required by their RCRA post-closure permit.

<u>Overall Protection of Human Health and the Environment</u>. The no action alternative is protective of human health and the environment. The fate and transport analysis presented in Section 1.4 of the FS report showed that the strong brine pond soils are not a continuing source of groundwater contamination. Since the material from the strong

brine pond was removed and the area has been capped with clay, the soils in the strong brine pond area are not a direct contact, ingestion or inhalation hazard.

Compliance with ARARs. The no action alternative complies with the ARARs.

Long-Term Effectiveness and Permanence. Alternative A would provide long-term effectiveness and permanence because no unacceptable risks to human health and the environment were identified under current and likely future exposure scenarios, and even without the existing institutional actions (e.g., caps and monitoring) conditions should remain protective.

Reduction of Toxicity, Mobility, and Volume. There would not be any additional reduction in toxicity, mobility, or volume of contaminants associated with this alternative.

Short-Term Effectiveness. There would not be any short-term adverse effects.

Implementability. Implementation is not required.

Cost. There would not be any additional costs.

Soils Alternative B1 - Institutional Actions (Cap Inspection/Maintenance, Groundwater Monitoring near Sanitary Landfills).

The planned cap inspection/maintenance programs for Alternative B1 as presented in the FS report would be expanded to include the strong brine pond area. The strong brine pond maintenance/inspection programs would be added to the provisions of Olin's post-closure hazardous waste permit. Any corrective measures warranted as a result of these programs would be conducted as part of the ongoing RCRA activities.

Overall Protection of Human Health and the Environment. Alternative B1 would be protective of human health and the environment in the strong brine pond area. It would provide added protection (over no action) because it would ensure continued maintenance of the cap. The existing cap would be upgraded as necessary through the inspection and maintenance procedures.

Compliances with ARARs. Alternative B1 would comply with ARARs, and inclusion of the strong brine pond would not affect the evaluation against this criteria.

Long-Term Effectiveness and Permanence. Alternative B1 would provide some added long-term effectiveness (over no action) in the strong brine pond area with the monitoring/maintenance programs by ensuring that conditions do not change (i.e., risks do not increase). The alternative is considered permanent even though it includes long-term maintenance and monitoring programs because no unacceptable risks to human health and the environment were identified for current and likely future conditions with the no action alternative.

Reduction of Toxicity, Mobility and Volume. There would not be any additional reduction in toxicity, mobility, and volume of contaminants in the strong brine pond area associated with this alternative. However, the cap maintenance programs would ensure that the mobility of constituents would not increase.

Short-Term Effectiveness. There would not be any short-term adverse effects associated with implementing the institutional actions in the strong brine pond area.

Implementability. The actions for the strong brine pond could be easily implemented.

Cost. There would be a relatively minor increase in cost (over Alternative B1 in the FS) due to expansion of the cap inspection/maintenance programs to include the strong brine pond area. The following table summarizes the estimated capital, O&M, and total alternative present worth cost for Alternative B1 with inclusion of the strong brine pond area. It is an update to the cost table for Alternative B1 presented on page 4-69 of the FS report. The referenced cost table is presented in Attachment 1.

Soil Alternative B1 Sanitary Landfills, Lime Ponds, Mercury Cell Plant Well Sand Residue Area and Strong Brine Pond Area Alternative Component	Cost Table	Estimated Present Worth Capital Cost ($)	Estimated Present Worth O&M Cost ($)	Estimated Present Worth Total Cost ($)
Institutional Actions	42	244,000	2,982,000	3,226,000

Soils Alternative B2 - Institutional Actions (Cap Inspection/Maintenance, Expanded Groundwater and Surface Water Monitoring)

Similar to Alternative B1, the planned cap inspection/maintenance programs for Alternative B2 would be expanded to include the strong brine pond area. The strong brine pond inspection/maintenance programs would be added to the provisions of Olin's post-closure hazardous waste permit. Any corrective measures warranted as a result of these programs would be conducted as part of the ongoing RCRA activities.

Alternative B2 would also include expanded groundwater monitoring in the vicinity of the strong brine pond. Currently, as part of the RCRA quarterly monitoring programs, Olin samples monitor wells BR7, BR7D, and BR10 directly to the south of the strong brine pond (See Figure 1-4 in the FS report for well locations). This alternative would include three additional monitor wells in the vicinity of the strong brine pond to be added to Olin's quarterly groundwater monitoring programs. It was assumed that two new monitor wells would be installed and one existing monitor well (BR6) would be used. The addition of three monitor wells for the strong brine pond area would result in a total of 19 monitor wells to be added to Olin's quarterly groundwater monitoring programs as part of Alternative B2. The approximate well locations are shown on Figure 1.

<u>Overall Protection of Human Health and the Environment.</u> Alternative B2 would be protective of human health and the environment as stated in the FS report. The strong brine pond monitoring wells may provide some added protection, although the effectiveness of this monitoring is questionable as described below under long term effectiveness and permanence.

<u>Compliances with ARARs.</u> Alternative B1 would comply with ARARs, and inclusion of the strong brine pond would not affect the evaluation against this criteria.

<u>Long-Term Effectiveness and Permanence.</u> Alternative B2 would provide some added long-term effectiveness (over no action) with the monitoring/maintenance programs by ensuring that conditions do not change (i.e., risks do not increase). Similar to the lime ponds and the mercury cell plant, groundwater monitoring in the vicinity of the strong

brine pond would have minimal effectiveness. There is existing contamination in the Alluvial Aquifer beneath the facility, predominantly due to past releases from process units and some of the SWMUs/AOCs that are no longer releasing contaminants, e.g., the weak brine pond. The corrective action program (five corrective action wells located to contain and remove the contaminant plume) has increased the lateral migration of contaminants and changed the historical groundwater flow directions beneath the site. It would be very difficult to distinguish contamination due to past releases from a continuing release resulting from the strong brine pond. Additionally, monitoring is already conducted in the vicinity of the strong brine pond area because this area is directly adjacent to the RCRA closure of the weak brine pond and within the compliance boundaries of the existing RCRA monitoring programs.

Reduction of Toxicity, Mobility and Volume. There would not be any additional reduction in toxicity, mobility, and volume of contaminants in the strong brine pond area associated with this alternative. However, the cap maintenance programs would ensure that the mobility of constituents would not increase.

Short-Term Effectiveness There would not be any short-term adverse effects, with the possible exception of minimal effects associated with installing two additional monitor wells near the strong brine pond.

Implementability. The actions for the strong brine pond could be easily implemented.

Cost. There would be an increase in cost (over Alternative B2 in the FS) due to expansion of the cap inspection/maintenance programs to include the strong brine pond area and installation and sampling of additional monitor wells. The following table summarizes the estimated capital, O&M, and total alternative present worth cost for Alternative B2 with inclusion of the strong brine pond area. It is an update to the cost table for Alternative B2 presented on page 4-72 of the FS report. The referenced cost table is presented in Attachment 1.

Soil Alternative B2 Sanitary Landfills, Lime Ponds, Mercury Cell Plant Well Sand Residue Area and Strong Brine Pond Area Alternative Component	Cost Table	Estimated Present Worth Capital Cost ($)	Estimated Present Worth O&M Cost ($)	Estimated Present Worth Total Cost ($)
Expanded Institutional Actions	43	609,000	3,751,000	4,360,000

Alternative C1 - Containment (Sanitary Landfills, Lime Ponds and Strong Brine Pond Area)/Institutional Actions

Construction of a new clay cap over the strong brine pond area would be added to Alternative C1. This alternative would also include the institutional actions associated with Alternative B1.

The estimated area to be capped for the strong brine pond is 130,000 square feet. The existing topsoil and some of the existing clay would be stripped and stockpiled for possible use in constructing the cap. The strong brine pond cap would consist of a 2-foot compacted clay liner, with a permeability not to exceed 1 x 10^{-7} cm/s, and 1 foot of topsoil. The topsoil would be seeded and mulched to establish vegetation.

Overall Protection of Human Health and the Environment. Alternative B2 would be protective of human health and the environment. The cap would provide some minor added protection (over no action) with a more competent physical barrier over the strong brine pond. However, existing conditions are protective. The soils are not a continuing source of groundwater contamination and there is little potential for direct contact, inhalation or ingestion hazards because the material in the strong brine pond was removed and the area was backfilled and capped during closure. The inspection/ maintenance program would ensure continued protection.

Compliance with ARARs. Alternative C1 would comply with ARARs, and inclusion of the strong brine pond would not affect the evaluation against this criteria.

Long-Term Effectiveness and Permanence. The FS report states that Alternative C1 would provide some added long-term effectiveness (over no action) with construction of the caps and the monitoring/maintenance programs by ensuring that conditions do not change (i.e., risks do not increase). Construction of the cap over the strong brine pond would also provide some added long term effectiveness and permanence although this increase would be marginal as compared to existing conditions. The fate and transport analysis indicated that the soils are not a continuing source of groundwater contamination without consideration of the existing cap. An estimated 6 to 7 feet of imported material was placed in the area during closure, which should provide a permanent barrier from direct contact, inhalation or ingestion hazards.

Reduction of Toxicity, Mobility and Volume. The mobility of constituents in the strong brine pond area would be slightly reduced due to the improved cap. There would not be any reduction in toxicity or volume of contamination in the strong brine pond area.

Short-Term Effectiveness. There would not be any short-term adverse effects, with the possible exception of minimal effects associated with the strong brine pond cap construction. It is estimated that with the additional work associated with the strong brine pond, this alternative could be implemented within 8 to 12 months from the start of construction.

Implementability. The actions for the strong brine pond could be easily implemented.

Cost. There would be an increase in cost (over Alternative C1 in the FS) due to construction of the cap over the strong brine pond area and expansion of the cap inspection/maintenance programs. The following table summarizes the estimated capital, O&M, and total alternative present worth cost for Alternative C1 with inclusion of the actions in the strong brine pond area. It is an update to the cost table for Alternative C1 presented on page 4-75 of the FS report. The referenced cost tables are presented in Appendix G of the FS report (Tables 24 and 25) or in Attachment 1.

Soil Alternative C1 Sanitary Landfills, Lime Ponds, Mercury Cell Plant, Well Sand Residue Area and Strong Brine Pond Area Alternative Component	Cost Table	Estimated Present Worth Capital Cost ($)	Estimated Present Worth O&M Cost ($)	Estimated Present Worth Total Cost ($)
Sanitary Landfills (Clay Cap)	25	3,003,000	0	3,003,000
Lime Ponds (Multimedia Cap)	24	930,000	0	930,000
Strong Brine Pond Area	44	920,000	0	920,000
Institutional Actions	42	244,000	2,982,000	3,226,000
TOTAL		5,097,000	2,982,000	8,079,000

Alternative C2 - Consolidation/Containment (Sanitary Landfills, Lime Ponds Well Sand Residue Area and Strong Brine Pond Area)/Institutional Actions

Construction of a new clay cap over the strong brine pond would be added to Alternative C2. This alternative would also include the institutional actions associated with Alternative B1. Since the actions for the strong brine pond would be the same as for Alternative C1, the evaluation of the screening criteria as it applies to the strong brine pond would also be the same.

There would be an increase in the total alternative cost (over Alternative C2 in the FS) because of the cap and expanded inspection/maintenance programs. The following table summarizes the estimated capital, O&M, and total alternative present worth cost for Alternative C2 with inclusion of the strong brine pond area. It is an update to the cost table for Alternative C2 presented on page 4-78 of the FS report. The referenced cost tables are presented in Appendix G of the FS report (Tables 24, 25, and 26) or in Attachment 1.

Soil Alternative C2 Sanitary Landfills, Lime Ponds, Mercury Cell Plant, Well Sand Residue Area and Strong Brine Pond Area Alternative Component	Cost Table	Estimated Present Worth Capital Cost ($)	Estimated Present Worth O&M Cost ($)	Estimated Present Worth Total Cost ($)
Sanitary Landfills (Clay Cap)	25	3,003,000	0	3,003,000
Lime Ponds (Multimedia Cap)	24	930,000	0	930,000
Well Sand Residue Area (Consolidation)	26	273,000	0	273,000
Strong Brine Pond Area (Clay Cap)	44	920,000	0	920,000
Institutional Actions	42	244,000	2,982,000	3,226,000
TOTAL		5,370,000	2,982,000	8,352,000

4.2 Comparative Analysis

Section 4.3.4 of the FS report presents a comparative analysis of the OU-1 soil alternatives for the sanitary landfills, lime ponds, mercury cell plant and well sand residue area. The analysis identified whether the alternatives satisfy the two threshold criteria: protection of human health and the environment, and compliance with ARARs. A semi-quantitative rating system was used to show the relative performance of each alternative against the other five criteria. The addition of the specified actions for the strong brine pond area would not affect whether the alternatives satisfy the two threshold criteria, and also would not affect the semi-quantitative rating. Table 4 shows the results of the comparative analysis. This table is a modification of Table 4-10 from the FS report, adding actions for the strong brine pond area.

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TABLES

TABLE 1

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
No Action	None	None	Retained	Required for consideration by NCP.	7
Institutional Actions	Access restrictions	Fencing: Construct fence around strong brine pond to control access.	Screened out	Access to the plant area is already restricted by fencing and a guarded main entrance.	7
Institutional Actions	Access restrictions	Deed restrictions: Restrictions are placed on deeds concerning land usage.	Screened out	The deed for the McIntosh property already has a statement regarding the presence of hazardous waste on-site.	7
Institutional Actions	Monitoring/ maintenance	Cap inspection/maintenance: Develop, implement and document routine cap inspection, maintenance and cap improvement program.	Retained	Potentially applicable.	7
Institutional Actions	Monitoring	Groundwater monitoring: Increased groundwater monitoring in vicinity of strong brine pond.	Retained	Potentially applicable.	7
Containment Actions	Capping	Clay cap: Compacted clay covered with soil over strong brine pond.	Retained	Potentially applicable.	7
Containment Actions	Capping	Asphalt: Spray application of a layer of asphalt.	Retained	Potentially applicable.	7
Containment Actions	Capping	Concrete: Installation of concrete slabs over areas strong brine pond.	Retained	Potentially applicable.	7

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TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Containment Actions	Capping	Multimedia cap: Clay and synthetic membrane covered by soil over strong brine pond.	Retained	Potentially applicable.	5
Containment Actions	Vertical barriers	Sheet piling: Sheet piles act as low-permeability subsurface barrier walls that either contain, capture, or redirect groundwater flow at the site. Sheet piles can be made of wood, pre-cast concrete, or steel. Steel piles are the most effective in terms of groundwater cut-off and cost.	Screened out	Technology is used primarily to prevent migration of contaminated groundwater. The strong brine pond is not a continuing source of groundwater contamination.	5
Containment Actions	Vertical barriers	Slurry walls: Slurry walls act as low-permeability subsurface barrier walls that either contain, capture, or redirect groundwater flow at the site. Soil-bentonite slurry walls are the most common slurry walls. Less common are the cement-bentonite and or concrete (diaphragm) walls.	Screened out	Technology is used primarily to prevent lateral migration of contaminated groundwater. The strong brine pond is not a continuing source of groundwater contamination.	5
Containment Actions	Vertical barriers	Grouting: A process whereby one of a variety of fluids is injected into a rock or soil mass where it is set in place to reduce water flow and strengthen the formation. Grouting includes such technologies as rock grouting, and grout curtains.	Screened out	Has not yet been proven to be effective and reliable for hazardous waste sites. Technology is used primarily to prevent migration of contaminated groundwater. The strong brine pond is not a continuing source of groundwater contamination.	5

TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Containment Actions	Horizontal barriers	Grout injection: Drilling through the site and injecting a grout to form a horizontal or curved barrier to prevent the downward migration of contaminants.	Screened out	Technology is used primarily to prevent migration of contaminated groundwater. The strong brine pond is not a continuing source of groundwater contamination.	5
Containment Actions	Horizontal barriers	Block displacement: Displacement and bottom sealing of a block of earth isolated by perimeter barriers, by continued grout or slurry pumping to prevent the downward migration of contaminants.	Screened out	Technology is used primarily to prevent migration of contaminated groundwater. The strong brine pond is not a continuing source of groundwater contamination. Innovative technology: Information on the application of this technology to waste site remediation is not available.	5
Removal Actions	Excavation	Conventional excavation: Removal of soils using conventional excavation equipment such as backhoes.	Retained	Potentially applicable.	
Removal Actions	Excavation	Excavation followed by mechanical separation: Excavate and then separate potentially contaminated soil from construction and other debris.	Screened out	Not applicable. Strong brine pond material was removed and backfilled with fill. No mechanical separation would be necessary.	21

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TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	Encapsulation/ fixation	Stabilization/solidification: A technology by which the mobility of a chemical waste is reduced by either physically entrapping the waste and/or changing its chemical state. This technology can be categorized by the primary stabilizing agent used: cement-based, pozzolanic- or silicate based, thermoplastic-based, or organic polymer-based.	Retained	Potentially applicable.	13, 15
Treatment Actions	Physical/ chemical treatment	Acid extraction: Heavy metals are extracted from the soil by the addition of acid.	Retained	Potentially applicable.	19
Treatment Actions	Physical/ chemical treatment	Basic Extraction Sludge Treatment (BEST®): Is a solvent extraction process that uses one or more secondary or tertiary amines (usually triethylamine [TEA]) to separate organics from soils and sludges.	Screened out	Not applicable for mercury.	1, 4
Treatment Actions	Physical/ chemical treatment	Liquified gas: Liquified gas is used as solvent to extract organics from sludges, contaminated soils, and wastewater. Carbon dioxide is used for wastewaters and propane is used for sludges and contaminated soil.	Screened out	Not applicable for mercury.	1, 4

TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	Physical/ chemical treatment	Low-Energy Solvent Extraction Process (LEEP℠): Uses common organic solvents to extract and concentrate organic pollutants from soils, sediments, and sludges.	Screened out	Not applicable for mercury.	1, 4, 16
Treatment Actions	Physical/ chemical treatment	APEG-PLUS™: Similar to APEG™ Specifically uses potassium hydroxide and dimethyl sulfoxide to aid dehalogenation.	Screened out	Not applicable for mercury.	17, 18
Treatment Actions	Physical/ chemical treatment	Oxidation/reduction: Process is applied to destroy hazardous waste components or convert the hazardous components to less hazardous forms by raising the oxidation state of one reactant and lowering that of another.	Screened out	Potentially applicable for mercury but in aqueous solution.	1, 2, 5, 12, 15, 17, 20, 21
Treatment Actions	Physical/ chemical treatment	Soil washing: Technology that uses water and mechanical action to remove hazardous constituents that adhere physically to soil particles. Soil washing separates the fine-grained particles from the coarser fraction. It makes use of the fact that contaminants have tendency to adhere to organic carbon and fine-grained soil fraction (silt and clay) as opposed to coarse-grained mixed fraction (sand and gravel).	Screened out	The high percentage of fines (predominantly clay) present in strong brine pond material make this technology less favorable.	15, 17, 19

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TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	Thermal	Fluidized bed: Waste is injected into a hot agitated bed of sand whereby combustion occurs.	Screened out	Not applicable for mercury.	2, 15, 20
Treatment Actions	Thermal	Circulating bed combustor: Variation of fluidized bed incinerator - Uses higher air velocity and circulating solids to create a larger and highly turbulent combustion zone.	Screened out	Not applicable for mercury.	2, 4, 15, 17, 20
Treatment Actions	Thermal	Rotary kiln incineration: Involves the controlled combustion of organic wastes under net oxidizing conditions.	Screened out	Not applicable for mercury.	2, 15, 17, 20
Treatment Actions	Thermal	Infrared incineration: Uses silicon carbide elements to generate thermal radiation beyond the red end of the visible spectrum.	Screened out	Not applicable for mercury.	4, 15, 17, 20, 22
Treatment Actions	Thermal	Pyrolysis: Destruction of organic material in the absence of oxygen at a higher temperature.	Screened out	Not applicable for mercury.	15, 20
Treatment Actions	Thermal	Vitrification: A process by which organics are destroyed and inorganics are immobilized into a glassy material.	Screened out	Not applicable for mercury.	15

TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	Thermal	Advanced electric reactor: Uses electrically heated fluid walls to pyrolyze waste. Inorganic compounds melt and are fused into vitreous solids.	Screened out	Not applicable for mercury.	2, 17, 20, 22, 24
Treatment Actions	Thermal	Thermal desorption: Uses heat in a controlled environment to cause various organic compounds to volatilize and thereby be removed from contaminated material.	Retained	Potentially applicable.	4, 18, 19
Treatment Actions	Biological	Aerobic: Degradation of organics using microorganisms in an aerobic environment.	Screened out	Not applicable for mercury.	6, 7, 9, 10, 11, 15
Treatment Actions	Biological	Anaerobic: Degradation of organics using microorganisms in an anaerobic environment.	Screened out	Not applicable for mercury.	6, 7, 9, 10, 11, 15
Treatment Actions	Biological	Slurry phase: Excavated soil, sludge, or sediment is mixed with water to form a slurry that is agitated with environment amenable to biodegradation. Slurry is dewatered and the solids are disposed upon completion of the process.	Screened out	Not applicable for mercury.	6, 7, 9, 10, 11, 15, 19

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TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	Biological	Solid phase: Excavated soils are placed on a lined treatment bed, tank, or building. Microbial growth is facilitated by adding nutrients and other additives into the soil. Air and water may also be supplied to the soil.	Screened out	Not applicable for mercury.	6, 7, 9, 10, 11, 15, 19
Treatment Actions	In situ	In situ bioreclamation: System of injection and recovery wells introduce bacteria and nutrients to degrade contamination.	Screened out	Not applicable for mercury.	6, 9, 10, 11, 14, 15, 23
Treatment Actions	In situ	In situ soil flushing: An in situ process where the zone of contamination is flooded with water or a water-surfactant mixture in order to dissolve and mobilize the contaminants. Contaminants are then brought to the surface by a series of extraction wells.	Screened out	The permeability of the soil is low (clayey), making this technology not applicable.	14, 15, 23

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TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	In situ	In situ vacuum and steam extraction: Volatile organics present at the site are extracted by a series of injection/extraction wells. The vapors are extracted by applying either vacuum or pressure or a combination of both. Steam is also injected to raise the soil temperature and thereby enhance the recovery of the organics.	Screened out	Not applicable for mercury.	4, 14, 15, 23
Treatment Actions	In situ	In situ vitrification: Is an in situ process whereby the soil and waste is melted into a glassy, solid matrix resistant to leaching and more durable than granite or marble. Organics are destroyed and inorganics are immobilized.	Screened out	Not applicable for mercury.	15
Treatment Actions	In situ	In situ stabilization/solidification: An in situ process in which stabilizing/solidifying agents are added to the soil to reduce the mobility of chemicals by either physically entrapping them or changing their chemical state.	Retained	Potentially applicable.	3, 4, 13, 15

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TABLE 1 (Continued)

INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA

General Response Actions	Technology Type	Process Description	Status	Screening Comments	References[1]
Treatment Actions	In situ	In situ chemical treatment: A process by which a wide range of treatment agents, including precipitating and neutralizing chemicals, oxidizing/reducing agents, dechlorinating and chelating agents are delivered directly to the waste source.	Screened out	Concentrations are too low for this technology to be applicable.	14, 15
Disposal Actions	Off-site disposal	Landfill: Disposal of wastes in an off-site landfill.[2]	Retained	Potentially applicable.	
Disposal Actions	On-site disposal	Landfill: Disposal of wastes in an on-site landfill.[2]	Retained	Potentially applicable.	
Disposal Actions	Off-site incineration	Off-site incineration. Disposal of material at commercial RCRA incinerator.	Screened out	Not applicable for mercury.	

NOTES:

[1] References and other sources of information that were used to evaluate the technologies and process options are listed on the attached pages.

[2] Based on knowledge of the material, it is very unlikely that it would be classified as a RCRA hazardous waste and solid waste disposal options are assumed. If further characterization would indicate classification as hazardous waste, the landfill option would be upgraded to RCRA disposal.

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4 9 0769

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TABLE 2

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
No Action	None	**None**	Effe tive. Soils in strong brine pond aie. are not a continuing source of grorndwater contamination. No unacceptable risk to human health or the environment from exposure to contaminated soils.	Implementable.	No additional costs.
Institutional Actions	Monitoring/ maintenance	**Cap inspection/ maintenance**	Effective. Would ensure continued protection to human health and environment. Maintenance program will be documented. As erosion areas develop or as inspection reveals areas of inadequate cap depth, repairs will be made by importing soil to recover the areas. Grass will then be re-established.	Easily implementable.	Low capital, low O&M.
Institutional Actions	Monitoring	**Groundwater monitoring**	Would provide additional monitoring to ensure continued protection of groundwater.	Readily implementable.	Low capital and O&M.
Containment Actions	Capping	**Clay cap**	Effective at preventing contact to contaminated soils and increased protection of groundwater.	Easily implementable.	Low capital, low O&M.
Containment Actions	Capping	Asphalt cap	Effective but susceptible to weathering and cracking; clay or multimedia cap more applicable for soils in strong brine pond area.	Easily implementable.	Moderate capital, low O&M.

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TABLE 2 (Continued)

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
Contaminant Actions	Capping	Concrete	Effective but susceptible to weathering and cracking; clay or multimedia cap more applicable for soils in strong brine pond area.	Easily implementable.	Moderate capital, low O&M.
Containment Actions	Capping	**Multi-media cap**	Effective at preventing contact to contaminated soils and increased protection of groundwater.	Easily implementable.	Moderate capital, low O&M.
Removal	Excavation	Conventional excavation	Soils in strong brine pond area are not a continuing source of groundwater contamination. The fate and transport analysis indicates that even if the area was not capped the soils would not be a continuing source of groundwater contamination. The cap prevents contact of contaminated soils to humans and contaminated surface water runoff that could affect the environment. Removal followed by disposal or removal followed by treatment actions would provide marginal, if any, increased effectiveness over existing conditions.	Readily implementable.	Moderate capital, low to no O&M.

TABLE 2 (Continued)

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
Treatment	Encapsulation/ Fixation	Stabilization/ solidification	The primary purpose of this technology is to reduce infiltration of contaminants from the soil matrix to the groundwater. The soils in the strong brine pond area are not a continuing source of groundwater contamination. The fate and transport analysis indicates that even if the soils were not capped they would not be a continuing source of groundwater contamination. Therefore this technology would provide marginal if any increased effectiveness over existing conditions.	Bench-scale testing would be required	Moderate capital, low O&M.
Treatment	Physical/ chemical treatment	Acid extraction	Questionable effectiveness due to clay matrix. Removal followed by treatment actions would provide marginal, if any, increased effectiveness over existing conditions.	Difficult to implement. Bench-scale testing would be required. Disposal or treatment of residuals would be required.	High capital, low to no O&M.

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TABLE 2 (Continued)

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA
BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
Treatment	Thermal	Thermal desorption	Volatile mercury could be desorbed. Further treatment and/or disposal would be needed. Soils in strong brine pond area are not a continuing source of groundwater contamination. The fate and transport analysis indicates that even if the soils were not capped they would not be a continuing source of groundwater contamination. The cap prevents contact of contaminated soils to humans and contaminated surface water runoff that could affect the environment. Removal followed by disposal or removal followed by treatment actions would provide marginal, if any, increased effectiveness over existing conditions.	Bench-scale tests would be required to determine implementability for mercury. Solids processing would be required as a pretreatment step. Potential debris could make difficult.	Very high capital, low to no O&M.

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TABLE 2 (Continued)

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
Treatment	In situ	In situ stabilization/ solidification	The primary purpose of this technology is to reduce infiltration of contaminants from the soil matrix to the groundwater. The soils in the strong brine pond area are not a continuing source of groundwater contamination. The fate and transport analysis indicates that even if the soils were not capped they would not be a continuing source of groundwater contamination. Therefore this technology would provide marginal if any increased effectiveness over existing conditions.	Bench- and possibly pilot-scale testing would be required.	Moderate capital, low O&M.

TABLE 2 (Continued)

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
Disposal	Off-site	Off-site landfill	Effective for containment of waste. No reduction of chemical toxicity or volume. Contaminants are removed from the site. Soils in strong brine pond area are not a continuing source of groundwater contamination. The fate and transport analysis indicates that even if the area was not capped the soils would not be a continuing source of groundwater contamination. The cap prevents contact of contaminated soils to humans and contaminated surface water runoff that could affect the environment. Removal followed by disposal or removal followed by treatment actions would provide marginal, if any, increased effectiveness over existing conditions.	Implementable. Waste has to be transported to the landfill. Land disposal restrictions may apply.	Very high capital, none to low O&M.

TABLE 2 (Continued)

EVALUATION OF PROCESS OPTIONS FOR OU-1 SOIL IN THE STRONG BRINE POND AREA BASED ON EFFECTIVENESS, IMPLEMENTABILITY, AND COST

General Response Actions	Technology Type	Process Options*	Effectiveness[1]	Implementability	Cost
Disposal	On-site	On-site landfill	Effective for containment of waste. No reduction of chemical toxicity or volume. Soils in strong brine pond area are not a continuing source of groundwater contamination. The fate and transport analysis indicates that even if the area was not capped the soils would not be a continuing source of groundwater contamination. The cap prevents contact of contaminated soils to humans and contaminated surface water runoff that could affect the environment. Removal followed by disposal or removal followed by treatment actions would provide marginal, if any, increased effectiveness over existing conditions.	Difficult to implement - minimum technical requirements (MTR) and land disposal restrictions may apply. Agency and state/public acceptance could interfere.	Very high capital, moderate O&M.

NOTES:

1 The effectiveness evaluation is based on the ability of the process option to achieve the remedial action objective. The evaluation focused on the following:

- The potential effectiveness of process options in handling each medium and meeting the goals identified in the general response actions.
- The effectiveness of the process options in protecting human health and the environment during the construction and implementation phases.
- The proven history and reliability of the process options with respect to contaminants and conditions such as those at the site.

* Shaded process options are retained.

TABLE 3

SUMMARY OF DETAILED ANALYSIS
OU-1 SOIL
SANITARY LANDFILLS, LIME PONDS,
MERCURY CELL PLANT, WELL SAND RESIDUE AREA AND STRONG BRINE POND AREA

Alternative	Overall Protection of Human Health and Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility and Volume	Short-Term Effectiveness	Implementability	Present Worth Cost Estimate ($1,000)
Alternative A: No Action	Protective: The fate and transport analysis, which was conducted without consideration of the existing caps, shows that the five SWMUs/AOCs are not continuing sources of groundwater contamination. Risk calculations indicate that the soils would provide continued protection of human health from ingestion, direct contact and inhalation hazards for any current or likely future conditions. Any unacceptable surface water runoff from these SWMUs/AOCs would be detected with the existing NPDES and stormwater monitoring programs.	Would Comply: Implemented in conjunction with the RCRA CAP would comply with chemical-specific ARARs for Groundwater (See Table 4-1 of FS report). Olin currently complies with action-specific ARARs. There are no known location-specific ARARS for OU-1 soils.	Would provide long-term effectiveness and permanence because no unacceptable risks to human health and the environment were identified, and even without the existing institutional actions (e.g., caps and monitoring) conditions should remain protective.	No reduction in toxicity or mobility.	No short term adverse effects.	Implementation is not required.	None

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TABLE 3 (Continued)

SUMMARY OF DETAILED ANALYSIS
OU-1 SOILS
SANITARY LANDFILLS, LIME PONDS,
MERCURY CELL PLANT, WELL SAND RESIDUE AREA AND STRONG BRINE POND AREA

Alternative	Overall Protection of Human Health and Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility and Volume	Short-Term Effectiveness	Implementability	Present Worth Cost Estimate ($1,000)
Alternative B1: Institutional Actions (Cap Inspection/ Maintenance, Groundwater Monitoring near Sanitary Landfills)	Protective: Would provide added protection (over no action) by ensuring continued maintenance of the caps. Groundwater monitoring would be extended to the sanitary landfill area where currently there is not routine monitoring.	Would Comply: Implemented in conjunction with the RCRA CAP would comply with chemical-specific ARARs for Groundwater (See Table 4-1 of FS report). Would be implemented to comply with action-specific ARARs. There are no known location-specific ARARS for OU-1 soils.	Would provide some added long-term effectiveness (over no action) by ensuring that conditions do not change (i.e., risks do not increase). The alternative is considered permanent even though it includes long-term maintenance and monitoring programs because no unacceptable risks to human health and the environment were identified with the no action alternative.	No reduction in toxicity, mobility, or volume. The cap maintenance programs would ensure that the mobility of constituents would not increase.	There would be little to no short-term adverse effects	Could be easily implemented.	$3,226

TABLE 3 (Continued)

SUMMARY OF DETAILED ANALYSIS
OU-1 SOILS
SANITARY LANDFILLS, LIME PONDS,
MERCURY CELL PLANT, WELL SAND RESIDUE AREA AND STRONG BRINE POND AREA

Alternative	Overall Protection of Human Health and Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility and Volume	Short-Term Effectiveness	Implementability	Present Worth Cost Estimate ($1,000)
Alternative B2: Institutional Actions (Cap Inspection/ Maintenance, Expanded Groundwater and Surface Water Monitoring)	Protective: Would provide added protection (over no action) by ensuring continued maintenance of the caps. Groundwater monitoring would be extended to the sanitary landfill area where currently there is not routine monitoring.	Would Comply: Implemented in conjunction with the RCRA CAP would comply with chemical-specific ARARs for Groundwater (See Table 4-1 of FS report). Would be implemented to comply with action-specific ARARs. There are no known location-specific ARARS for OU-1 soils.	Would provide some added long-term effectiveness (over no action) by ensuring that conditions do not change (i.e., risks do not increase). The alternative is considered permanent even though it includes long-term maintenance and monitoring programs because no unacceptable risks to human health and the environment were identified with the no action alternative. Groundwater monitoring in the vicinity of the lime ponds, the mercury cell plant and the strong brine pond area would have limited effectiveness. The additional surface water sampling would also have limited effectiveness.	No reduction in toxicity, mobility, or volume. The cap maintenance programs would ensure that the mobility of constituents would not increase.	There would be little to no short-term adverse effects	Could be easily implemented.	$4,360

4 9 0776

TABLE 3 (Continued)

SUMMARY OF DETAILED ANALYSIS
OU-1 SOILS
SANITARY LANDFILLS, LIME PONDS,
MERCURY CELL PLANT, WELL SAND RESIDUE AREA AND STRONG BRINE POND AREA

Alternative	Overall Protection of Human Health and Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility and Volume	Short-Term Effectiveness	Implementability	Present Worth Cost Estimate ($1,000)
Alternative C1: Containment (Sanitary Landfills, Lime Ponds and Strong Brine Pond Area)/ Institutional Actions	Protective: Would provide added protection (over no action) with more competent physical barriers over the sanitary landfill soils, the lime ponds and the strong brine pond area. Would provide added protection (over no action) by ensuring continued maintenance of the caps. Groundwater monitoring would be extended to the sanitary landfill area where currently there is not routine monitoring.	Would Comply: Implemented in conjunction with the RCRA CAP would comply with chemical-specific ARARs for Groundwater (See Table 4-1 of FS report). Would be implemented to comply with action-specific ARARs. There are no known location-specific ARARS for OU-1 soils.	Would provide some added long-term effectiveness (over no action) with construction of the caps and the monitoring/ maintenance programs by ensuring that conditions do not change	Mobility would be reduced due to the improved caps. There would be no reduction in toxicity or volume of contamination.	There would be little to no short-term adverse effects	Readily implementable.	$8,079

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TABLE 3 (Continued)

SUMMARY OF DETAILED ANALYSIS
OU-1 SOILS
SANITARY LANDFILLS, LIME PONDS,
MERCURY CELL PLANT, WELL SAND RESIDUE AREA AND STRONG BRINE POND AREA

Alternative	Overall Protection of Human Health and Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility and Volume	Short-Term Effectiveness	Implementability	Present Worth Cost Estimate ($1,000)
Alternative C2: Consolidation/ Containment (Sanitary Landfills, Lime Ponds, Well Sand Residue Area and Strong Brine Pond Area)/ Institutional Actions	Protective: Would provide added protection (over no action) with more competent physical barriers over the sanitary landfill soils and the lime ponds, and containment of the well sand residue. Would provide added protection (over no action) by ensuring continued maintenance of the caps. Groundwater monitoring would be extended to the sanitary landfill area where currently there is not routine monitoring.	Would Comply: Implemented in conjunction with the RCRA CAP would comply with chemical-specific ARARs for Groundwater (See Table 4-1 of FS report). Would be implemented to comply with action-specific ARARs. There are no known location-specific ARARS for OU-1 soils.	Would provide some added long-term effectiveness (over no action) with construction of the caps and the monitoring/ maintenance programs by ensuring that conditions do not change. Containment of the well sand would provide marginal, if any, added effectiveness because it is a cemented material with mercury bound in the matrix.	Mobility would be reduced due to the improved caps. There would be no reduction in toxicity or volume of contamination.	There would be little to no short-term adverse effects	Readily implementable.	$8,352

TABLE 4

OU-1 SOILS
SANITARY LANDFILLS, LIME PONDS, MERCURY CELL PLANT, WELL SAND RESIDUE AREA AND STRONG BRINE POND AREA
SUMMARY OF COMPARATIVE ANALYSIS

Criteria	No Action with Continuation of Existing CAP	OU-1 Soil Alternative			
	A	B1	B2	C1	C2
Overall Protection of Human Health and The Environment	Y	Y	Y	Y	Y
Compliance With ARARs	Y	Y	Y	Y	Y
Long-Term Effectiveness and Permanence	3	4	4	5	5
Reduction in Mobility, Toxicity or Volume	1	2	2	3	4
Short-Term Effectiveness	5	5	4	4	3
Implementability	5	5	4	3	3
Cost	5	4	3	2	1

NOTES:

Y = Would comply.

A rating of 5 shows the greatest relative performance against the criteria and a rating of 1 shows the least.

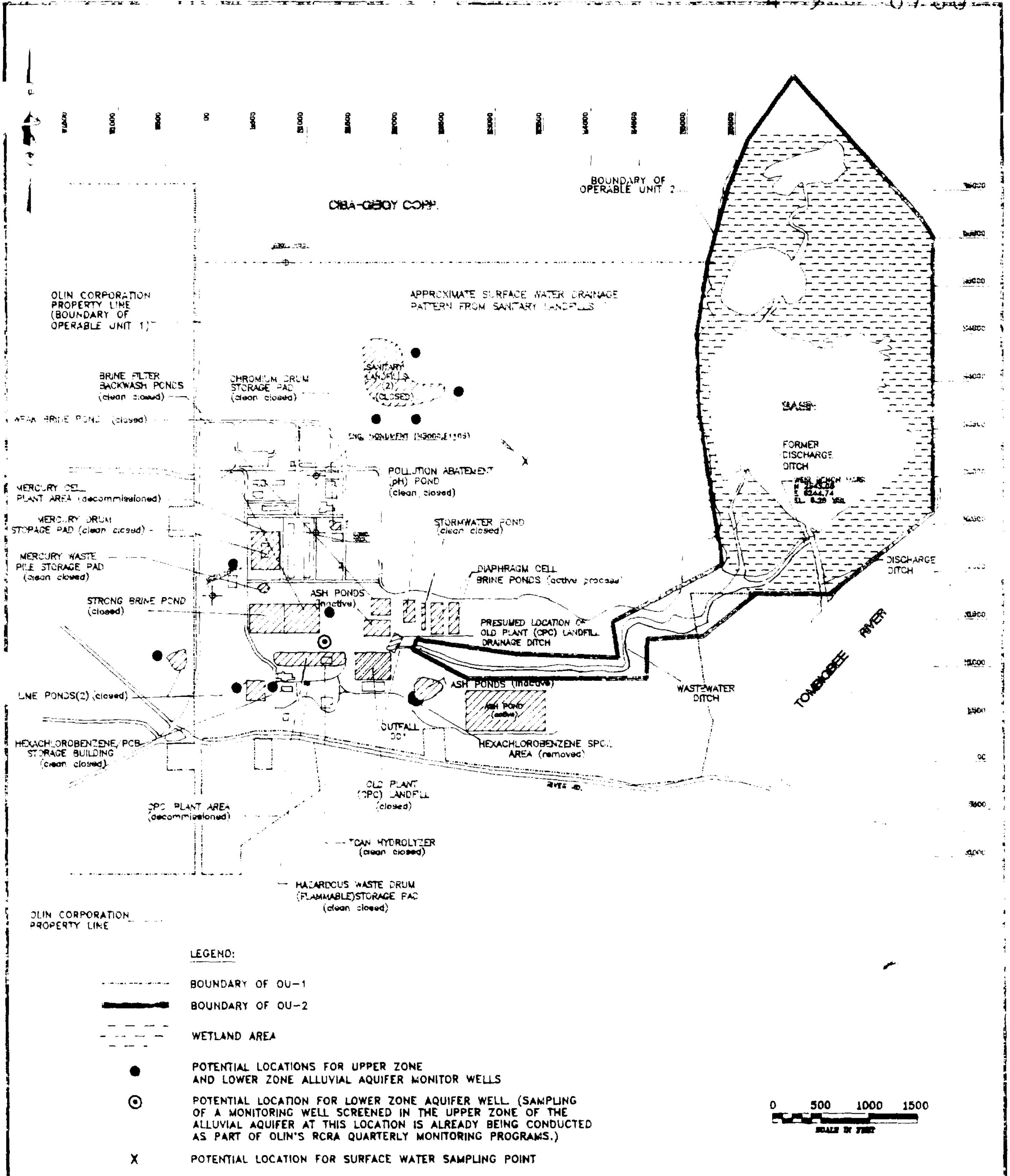
Alternative B1 - Institutional Actions (Cap Inspection/Maintenance, Groundwater Monitoring Near Sanitary Landfills)

Alternative B2 - Expanded Institutional Actions (Cap Inspection/Maintenance, Expanded Groundwater and Surface Water Monitoring)

Alternative C1 - Containment (Sanitary Landfills, Lime Ponds and Strong Brine Pond Area)/Institutional Actions

Alternative C2 - Consolidation/Containment (Sanitary Landfills, Lime Ponds, Well Sand Residue Area and Strong Brine Pond Area)/Institutional Actions

FIGURES



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OLIN CHEMICALS	Woodward-Clyde Consultants Consulting Engineers, Geologists and Environmental Scientists Baton Rouge, Louisiana	SOIL ALTERNATIVE B2 EXPANDED INSTITUTIONAL ACTIONS	FILE NO. 90B449C FIG. NO. 1
	SCALE: SHOWN	DRAWN BY: PCG — DATE: 10/19/93 CHKD. BY: [illegible] — DATE: 2/2[illegible]/94	

ATTACHMENT 1

COST TABLES FOR ALTERNATIVES FOR OU-1 SOILS, MODIFIED TO INCLUDE THE STRONG BRINE POND AREA

TABLE 42

OLIN CHEMICALS - McINTOSH, ALABAMA PLANT SITE FEASIBILITY STUDY COST ESTIMATE								
TECHNOLOGY OR PROCESS OPTION: INSTITUTIONAL ACTIONS FOR ALTERNATIVE B1 W/ STRONG BRINE POND								
CONSTRUCTION ITEM	COST SOURCE*	QUANTITY	UNITS	UNIT PRICE	BASE COST	SAFETY LEVEL	COST FACTOR	TOTAL COST
1. Monitoring Well Installation	1	6	EACH	$12,500	$75,000	mD	1.3	$97,500
2.								
3.								
4.								
5.								
6.								
7. Unlisted items		1	LS		$20,000		1	$20,000
TOTAL DIRECT COST								$117,500
ADDITIONAL COSTS					PERCENTAGE OF DIRECT COST			COST
ENGINEERING SERVICES COST					35			$41,125
CONSTRUCTION SERVICES COST					20			$23,500
PERMITTING AND LEGAL SERVICES COST					5			$5,875
SUBTOTAL								$188,000
CONTINGENCY ALLOWANCE					30			$56,400
TOTAL TECHNOLOGY CAPITAL COST								$244,000
OPERATION AND MAINTENANCE (O&M) ITEMS	COST SOURCE*	QUANTITY	UNITS	UNIT PRICE	BASE COST	SAFETY LEVEL	COST FACTOR	YEARLY COST
1. Mowing	7	24	EACH	$2,000	$48,000	D	1	$48,000
2. Monitoring and Reporting	1	1	LS	$30,000	$30,000	D	1	$30,000
3. Sampling/Analytical	1	32	EACH	$750	$24,000	D	1	$24,000
4. Repairs and Maineneance	1	1		$60,000	$60,000	D	1	$60,000
		0		$0	$0		1	$0
Unlisted items		1	LS		$32,000			$32,000
TOTAL TECHNOLOGY O&M YEARLY COST								$194,000
TOTAL TECHNOLOGY O&M PRESENT WORTH (5% & 30 Years)								$2,982,000
TECHNOLOGY OR PROCESS OPTION TOTAL -								**$3,226,000**

* Sources of unit costs are provided in Appendix G of the FS report.

TABLE 43

OLIN CHEMICALS - McINTOSH, ALABAMA PLANT SITE FEASIBILITY STUDY COST ESTIMATE								
TECHNOLOGY OR PROCESS OPTION: INSTITUTIONAL ACTIONS FOR ALTERNATIVE B2 W/ STRONG BRINE POND								
CONSTRUCTION ITEM	COST SOURCE*	QUANTITY	UNITS	UNIT PRICE	BASE COST	SAFETY LEVEL	COST FACTOR	TOTAL COST
1. Monitoring Well Installation	1	15	EACH	$12,500	$187,500	mD	1.3	$243,750
2.								
3.								
4.								
5.								
6.								
7. Unlisted items		1	LS		$49,000		1	$49,000
TOTAL DIRECT COST								$292,800
ADDITIONAL COSTS					PERCENTAGE OF DIRECT COST			COST
ENGINEERING SERVICES COST					35			$102,480
CONSTRUCTION SERVICES COST					20			$58,560
PERMITTING AND LEGAL SERVICES COST					5			$14,640
SUBTOTAL								$468,480
CONTINGENCY ALLOWANCE					30			$140,544
TOTAL TECHNOLOGY CAPITAL COST								$609,000
OPERATION AND MAINTENANCE (O&M) ITEMS	COST SOURCE*	QUANTITY	UNITS	UNIT PRICE	BASE COST	SAFETY LEVEL	COST FACTOR	YEARLY COST
1. Mowing	7	24	EACH	$2,000	$48,000	D	1	$48,000
2. Monitoring and Reporting	1	1	LS	$35,000	$35,000	D	1	$35,000
3. Sampling/Analytical	1	80	EACH	$750	$60,000	D	1	$60,000
4. Repairs and Maineneance	1	1		$60,000	$60,000	D	1	$60,000
		0		$0	$0		1	$0
Unlisted items		1	LS		$41,000			$41,000
TOTAL TECHNOLOGY O&M YEARLY COST								$244,000
TOTAL TECHNOLOGY O&M PRESENT WORTH (5% & 30 Years)								$3,751,000
TECHNOLOGY OR PROCESS OPTION TOTAL -								$4,360,000

* Sources of unit costs are provided in Appendix G of the FS report.

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TABLE 44

OLIN CHEMICALS - McINTOSH, ALABAMA PLANT SITE FEASIBILITY STUDY COST ESTIMATE								
TECHNOLOGY OR PROCESS OPTION: CLAY CAP					**STRONG BRINE POND**			
CONSTRUCTION ITEM	COST SOURCE*	QUANTITY	UNITS	UNIT PRICE	BASE COST	SAFETY LEVEL	COST FACTOR	TOTAL COST
1. Mobilization/Demobilization	5	1	LS	$12,000	$12,000	D	1	$12,000
2. Clearing and grubbing	6	3	ACRES	$550	$1,650	D	1	$1,650
3. Grading	6	14500	SY	$2.00	$29,000	D	1	$29,000
4. Clay Liner - 2 ft thick	7	10000	CY	$20	$200,000	D	1	$200,000
5. Topsoil - 1 ft	7	5000	CY	$12.50	$62,500	D	1	$62,500
6. Seeding	7	3	ACRES	$1,800	$5,400	D	1	$5,400
7. Perimeter Ditch	7	1440	LF	$40	$57,600	D	1	$57,600
8. Unlisted items		1	LS		$74,000		1	$74,000
TOTAL DIRECT COST								$442,200
ADDITIONAL COSTS					PERCENTAGE OF DIRECT COST			COST
ENGINEERING SERVICES COST					20			$88,440
CONSTRUCTION SERVICES COST					30			$132,660
PERMITTING AND LEGAL SERVICES COST					10			$44,220
SUBTOTAL								$707,520
CONTINGENCY ALLOWANCE					30			$212,256
TOTAL TECHNOLOGY CAPITAL COST								$920,000
OPERATION AND MAINTENANCE (O&M) ITEMS	COST SOURCE*	QUANTITY	UNITS	UNIT PRICE	BASE COST	SAFETY LEVEL	COST FACTOR	YEARLY COST
		0		$0	$0		1	$0
		0		$0	$0		1	$0
		0		$0	$0		1	$0
Unlisted items		1	LS		$0			$0
TOTAL TECHNOLOGY O&M YEARLY COST								$0
TOTAL TECHNOLOGY O&M PRESENT WORTH (5% & 30 Years)								$0
TECHNOLOGY OR PROCESS OPTION TOTAL -								**$920,000**

* Sources of unit costs are provided in Appendix G of the FS report.

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